MARIN COUNTY
ELECTRIC VEHICLE CHARGING STATION SITING PLAN

DRAFT REPORT November 2018

This report was developed by the Transportation Authority of Marin, in cooperation with the Transportation Authority of Marin's Clean Transportation Technology Working Group

Transportation Authority of Marin's Clean Transportation Technology Advisory Working Group

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I. EXECUTIVE SUMMARY

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II. LIST OF TERMS

BAAQMD	Bay Area Air Quality Management District
BEV	Battery Electric Vehicle
CARB	California Air Resources Board
CARE	Community Air Risk Evaluation
CEC	California Energy Commission
CCS	Combined Charging System
ChaDeMO	trade name of a quick charge connector
COC	Community of Concern
CVRP	Clean Vehicle Rebate Program
DCFC	Direct-current fast charging equipment, also called Level 3
EV	Electric vehicle, including plug-in hybrids and battery electric vehicles
GHG	Greenhouse Gas
EVSE	Electric Vehicle Supply Equipment (also known as EV charging stations or EV chargers)
MCE	Formerly Marin Clean Energy,
MCEP	Marin Clean Energy Partnership
MTC	Metropolitan Transportation Commission
MUD:	A multi-unit dwelling (also known as multi-family building)
PGE	Pacific Gas and Electric
PHEV	Plug-in Hybrid electric vehicle
SAE	Society of Automotive Engineers
TAM	Transportation Authority of Marin
ZEV	Zero-emissions vehicle

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III. BACKGROUND

The Transportation Authority of Marin (TAM), as a Congestion Management Agency and the Transportation Sales Tax Authority of Marin County, manages and coordinates transportation projects in Marin County, with local, regional, state, and federal funding.

TAMs mission statement is as follows:

> *TAM is dedicated to making the most of Marin County transportation dollars and creating an efficient and effective system that promotes mobility and accessibility by providing a variety of high quality transportation options to all users.*

Thanks to Marin County voter support of transportation funding, there are two revenue sources that are dedicated to transportation projects and programs in Marin County. TAM administers Measure A, the ½ cent sales tax measure passed in 2004 and Measure B, the $10 Vehicle Registration Fee passed in 2010. Revenues generated by Measure B contribute about $2.4 million per year to Marin County transportation projects and programs and provides funding for alternative fuels infrastructure and promotion among other transportation programs. The goal of the alternative fuels program is to coordinate, support and enhance Marin's development of public EV charging stations and Public Fleet conversion to EV's.

In 2011, TAM developed the "Report on Preliminary Plans for the Siting and Placement of Publicly-Accessible Electric Vehicle Charging Stations throughout Marin County." Referred to as the 2011 EV Site Plan, this report worked collaboratively with local jurisdictions to identify locations for a first wave of EV charging equipment in Marin County.

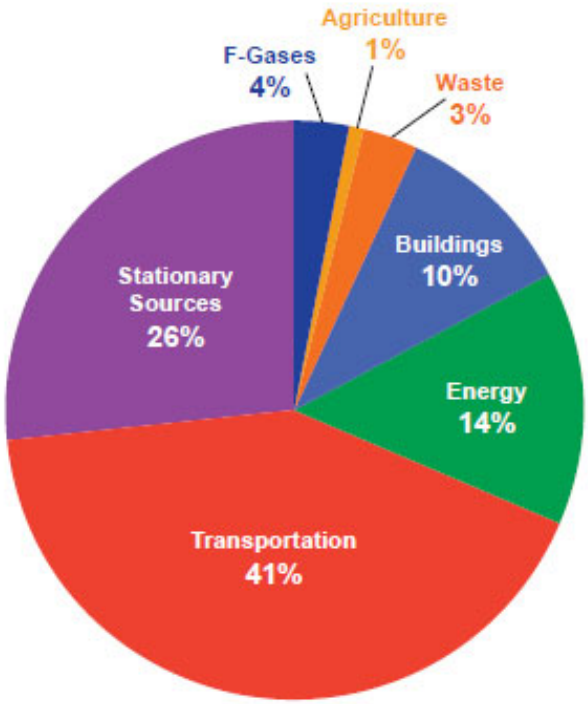
Public Charging Station Located in downtown San Rafael

Since the 2011 site plan has been developed, the EV industry and supply of EV chargers has changed dramatically. Marin County has the 2nd highest per capita EV ownership of any county in the California, and with 58 charging stations and 201 charging ports, there is more EV charging stations than gas stations in Marin County. EV options and range have also expanded, with more EV's being offered to the public.

Additionally, public agencies and private companies have all dramatically increased their investment in EVs since 2011. Public utility providers and the California Air Resources Board are developing programs to reduce Greenhouse Gas Emissions and meet state mandates of 5 million Zero Emission Vehicles (ZEVs) by 2030.

However, greenhouse gas emissions from transportation remains the largest source of greenhouse gas emissions in California and the Bay Area. In order to tackle this challenge, a partnership of utilities, local jurisdictions, regional and state agencies from a wide variety of sectors will be required. Marin County and all 11 cities and towns have worked closely with their communities and developed Climate Action Plans inventorying greenhouse gas emissions and setting targets to reduce GHG emissions to 1990 levels from both community and municipal activities.

Bay Area Greenhouse Gas Emissions by Source Category, 2015.[1]



[1] Source: Bay Area Air Quality Management District Clean Air Plan 2017

In order to help encourage EV adoption and infrastructure development to improve air quality (and GHG emissions), TAM has continuously administered an Alternative Fuel Program to support local public agencies and reduce harmful emissions. TAM provides an incentive for public agencies to install charging infrastructure, an EV fleet program to convert municipal fleets to clean technology solutions, and a public outreach program to increase the public's awareness of electric vehicles. To date, TAM has helped fund 60 charging heads in Marin County, and with additional funding from other public and private investment, TAMs investment in EV charging equipment is increasing.

This 2018 plan takes these considerations and more to lay out a path forward for TAM's public agency EV charging program and other potential locations for the expansion of EV charging equipment in Marin County.

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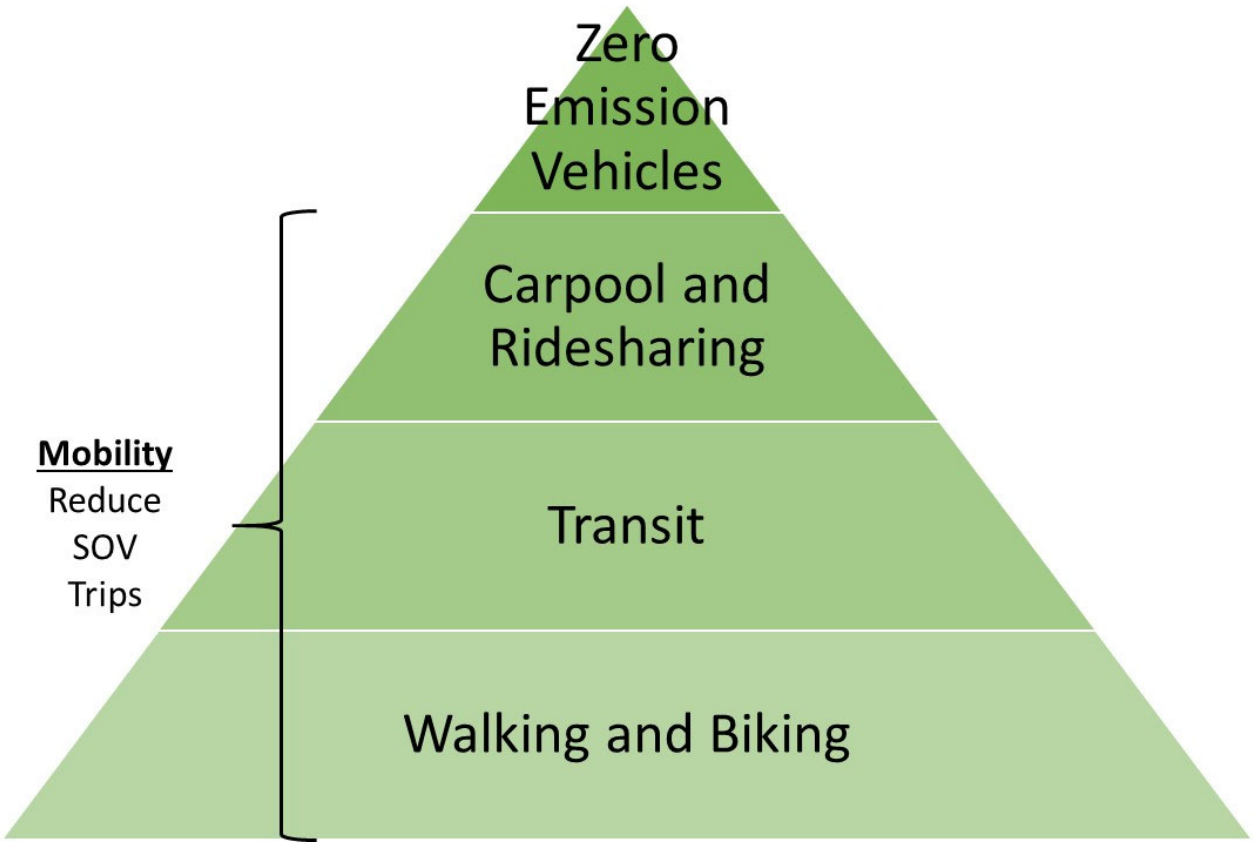
IV. The EV Landscape

As an emergent technology, the EV landscape is evolving rapidly. New vehicles, technology, funding and regulations all play a role in developing EV charging programs. As TAM plans for increased EV charging stations, an assessment of these current conditions is necessary to support the thoughtful and strategic roll out of EV charging equipment.

TAMs role of congestion management agency and sales tax authority serves all modes of transportation in Marin County, funding transportation programs that promote mobility, congestion reduction, and GHG reductions. In order to achieve goals of mobility and congestion reduction, TAM goals emphasize mode shift through walking, biking, transit, carpooling, and ridesharing. For trips that do require single occupant vehicles, alternative fuel vehicles such as EVs are preferred due to the air quality and greenhouse gas reduction benefits compared to traditional fossil fuel vehicles.

TAMs Mobility Framework[2]



[2] Inspired by https://www.smgov.net/departments/pcd/agendas/Planning-Commission/2017/20171004/Electric%20Vehicle%20Action%20Plan/7A%20attachment%20A%20EV%20Action%20Plan%20Draft.pdf

AB 32, the Global Warming Solutions Act of 2006

Since 2005, the State of California has responded to growing concerns over the effects of climate change by adopting a comprehensive approach to addressing emissions in the public and private sectors. This approach was officially initiated with the passage of the Global Warming Solutions Act of 2006 (AB 32), which requires the state to reduce its greenhouse gas emissions to 1990 levels by 2020. The AB 32 Scoping Plan was developed to identify strategies for meeting the AB 32 goal, and was adopted by the California Air Resources Board (ARB) in December 2008. Among many other strategies, it encourages local governments to reduce emissions in their jurisdictions by 15 percent below current levels by 2020.

Local Climate Action Plans

Climate Action Plans set local targets to reduce GHG emissions consistent with the state of California's AB 32, the landmark Global Warming Solutions Act of 2006. Climate action plans have reported a Marin County total GHG reduction of 17% since 2005, with a 9% reduction in transportation emissions, according to the Marin Climate and Energy Partnership.[3] The mission of the Marin Climate & Energy Partnership (MCEP) is to create a countywide partnership that allows partner members to work collaboratively, share resources and secure funding to:

> 1) discuss, study and implement overarching policies and programs, ranging from emission reduction strategies to adaptation, contained in each agency's Climate Action Plan; and
> 2) collect data and report on progress in meeting each partner member's individual greenhouse gas (GHG) emission targets.

According to MCEP, Marin County emissions totaled over 1.9 million metric tons in 2005. In order to meet our AB 32 target, emissions must drop 15% by the year 2020. As of 2015, countywide emissions were 17% below 2005 emissions.[4] In 2016, California enacted legislation (Senate Bill 32) which requires the State to reduce emissions another 40% by 2030. The State's long-term goal is to reduce emissions 80% below 1990 levels by 2050 – the amount that climate scientists say is necessary to cap global warming at 2 deg C (3.6 deg F) above pre-industrial levels.

Benefits of EVs

Widespread adoption of large number of elective vehicles offers a range of benefits for Marin County and Jurisdictions throughout the state, including public health improvements, clean air and GHG reductions[5]. Electric vehicles have the potential to address critical public health and environmental challenges in our cities and are critical for California to meet its climate goals described in detail below. Electric vehicles are far less polluting than gasoline-powered cars, emitting no tailpipe emissions while driving, producing half the carbon footprint of gasoline-

[3] http://marinclimate.org/results/greenhouse-gas-inventories
[4] http://marinclimate.org/results/greenhouse-gas-inventories
[5] https://environmentcalifornia.org/sites/environment/files/reports/Plugging%20In%20-%20Environment%20California%20-%20Feb%202018.pdf

powered cars over their lifetime, and spewing fewer emissions of the pollutants that contribute to smog and particulate matter, leading causes of respiratory illnesses like asthma[6]. Additionally, EVs offer lower fuel costs and lower maintenance costs, and access to HOV lanes for commuters.

TAM's May 2018 DriveClean Outreach Event showcasing BEV and ZEVs

State Mandates for Zero Emission Vehicles

In order to reduce GHG emissions from passenger vehicles, the largest source of transportation emissions, the state has passed increasing aggressive ZEV goals for the state, starting with Executive Order B-16-2012 which set a target of 1.5 million ZEVs by 2025. This goal was increased in 2018 to 5 million ZEVs by 2030 under executive order B-48-18.

[6] Kim Reynolds, "2018 Motor Trend Car of the Year Introduction," Motor Trend, 16 November 2017, archived at web.archive.org/ web/20171127235252/http://www.motortrend.com/ news/2018-motor-trend-car-of-the-year-introduction

Bay Area Transportation Emissions Detail, 2015.[7]

Figure 3-7. 2015 Bay Area GHG Emissions: Transportation (Total = 37 MMT CO_2e)

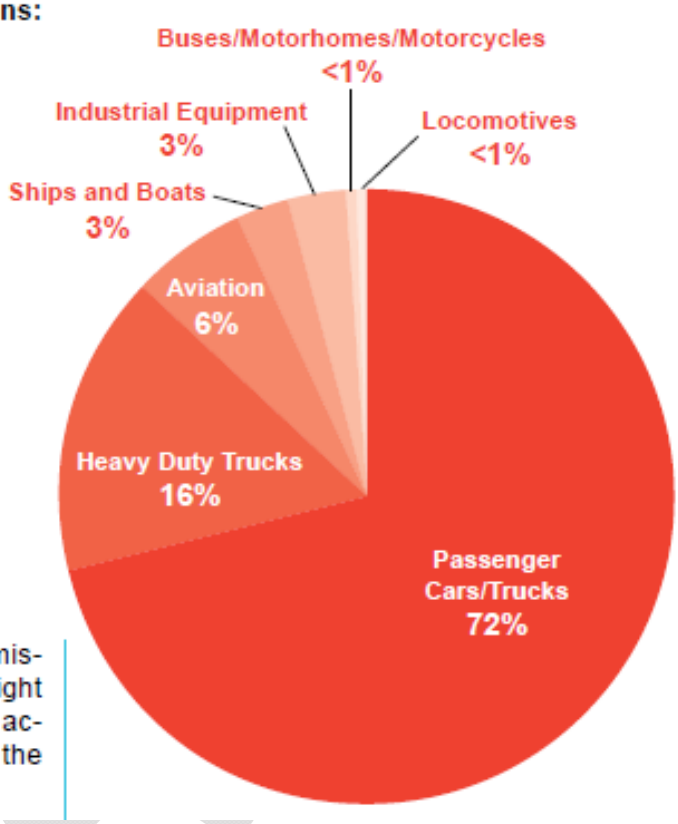


Figure 3-7 shows a breakdown of GHG emissions from transportation by vehicle type. Light and medium-duty cars and trucks currently account for 72 percent of GHG emissions from the transportation sector.

The Rise of the EV Market

Increasing EV adoption requires a wide range of EV vehicles to be available[8]. As EV costs have decreased, more vehicle options have become available, driving an increase in demand of EVs. During the development of the previous 2011 site plan in 2010, there was a limited number of BEV's in the market, primarily the Nissan Leaf (with a US EPA range of 100 miles) and one choice of commercially available plug in hybrid, the Chevy Volt (with an electric range of 40 miles.)

In 2018, there are now 22 BEV's with ranges extending well over 200 miles[9]. During the next couple of years, auto manufacturers are expected to develop an additional 127 electric Vehicles[10]. SUV's and trucks remain the most purchased vehicles in the US[11], and as EV options for these vehicles are released to market, EV adoption is expected to rise. Additionally, as vehicle options have increased, battery ranges have jumped dramatically.

[7] Source: Bay Area Air Quality Management District Clean Air Plan 2017
[8] Expanding the Electric Vehicle Market in US Cities, International Council on Clean Transportation, July 2017
[9] https://evrater.com/evs#ev-list
[10] https://www.bloomberg.com/news/features/2017-12-19/the-near-future-of-electric-cars-many-models-few-buyers
[11] https://www.businessinsider.com/best-selling-cars-and-trucks-in-us-2017-2018-1

EV Charging Basics

There are three levels of EV chargers, which charge at different rates depending on the voltage:

- **Level 1 chargers (120V)** are standard electrical outlets, and are the slowest and least expensive option. They provide 2-5 miles of charge per hour of charging time. Level 1 chargers are not typically considered acceptable for publicly accessible EV charger installation but can be used at home or as a last resort for EV charging.
- **Level 2 chargers (240V)** add about 10-20 miles of range per hour of charging time. This is a "standard" EV charger for most publicly available charging stations.
- **DC Fast chargers or Level 3 chargers (480V)** are the fastest charging option available and will add 50-70 miles of range in about 20-30 minutes.

There are a range of charging systems depending on level of charging, vehicle manufacturer and charging network. Level 2 chargers primarily use the Combined Charging System (CCS) J1772 Combo, and DC fast chargers or Level 3 chargers include CCS/SAE, ChaDeMo, and Tesla Superchargers. ChaDeMo, CCS/SAE and the J1772 are both brand agnostic, and Tesla Superchargers are currently for Tesla vehicles only.

The term "smart charger" refers to chargers with network connectivity, allowing for payment collection, demand or electric grid management and maintenance alerts for station hosts. Smart chargers make up the largest percentage of public Marin charging stations. "Dumb chargers" are also available in Marin County, typically utilized in private lots or locations, or when no fee is required for parking or charging, or when running communications to the charger is cost prohibitive.

Level 2 (j-1772) Public Charging Stations in Marin

Charging Behavior

According to recent reports, 80% of current electric vehicle charging is done at home. EV owners typically charge at home and, if offered, the workplace. If neither option is available, drivers rely on public charging infrastructure.[12]

As BEV'S become more prevalent and range increases due to new innovations, it is currently unclear what the likely effect will be on public chargers in Marin County. Some reports note that longer BEV range requires less public chargers to sufficiently support EV's in an area, however shorter ranged EV's available on the used EV car market may require more public chargers.[13] Additionally, many earlier models which shorter ranges are not capable of utilizing current Level 3 fast charging. Home chargers will likely always be the primary charging location but as BEV range increases, and workplace and Level 3 fast charging infrastructure proliferates, it is reasonable to assume that a greater percentage of charging will be done away from the home. for most PEV owners—if only because this is where most vehicles spend the majority of their time.

While there is qualitative data on the correlation between the availability of public charging and ownership of electric vehicles, there is limited cause and effect data that shows that an increase in public chargers is the factor increasing the ownership of electric vehicles.[14] However, public chargers provide alternative charging locations for owners, remind people that electric cars are on the market are often supported within their communities, and demonstrate that local government is dedicated to support GHG reduction (even if proving GHG reduction from publicly available charging equipment is limited.)

EV Incentive Programs

There are various incentives valuable to support electric vehicle adoption. These range from:

- Financial incentives on the purchase of new vehicles administered by utility providers, the State Clean Vehicle Rebate Program (CVRP) and the federal tax credit that provide financial incentives for the purchase (or lease) of new EVs,
- Travel time incentives provided by the state in proving access to High Occupancy Vehicle (HOV) Lanes,
- Charging infrastructure grants administered by local agencies such as TAM, air districts, energy providers and state agencies.
- Preferential parking locations
- Free parking at charging locations in some jurisdictions

EV Charging Infrastructure Programs

TAM currently administers a public agency specific grant providing up to $3,000 per charging

[12]Accelerating Investment in Electric Vehicle Charing, Ceres, March 2018

[13] Reoccurring and Indirect Incentives for Plug-in Electric Vehicles – A Review of the Evidence, UC Davis, September 2017

[14] Reoccurring and Indirect Incentives for Plug-in Electric Vehicles – A Review of the Evidence, UC Davis, September 2017

head for public agencies in Marin County. Regionally, the Bay Area Air Quality Management District (BAAQMD) has implemented its Charge! Program and PGE has launched a charging infrastructure program in its service area along with EV rate programs. In August of 2018, MCE launched their EV charging program for its service area as well. The state provides financing programs, and CARB has allocated $800 million of VW settlement funds to charging infrastructure throughout the State. The table below describes these programs and their applicability to respective land use types.

Land Use Type	Governance Level	Funding/Incentive Program
Residential	• Local Jurisdictions • Utility Providers • Air Districts • CCA's	• BAAQMD Charge! Rebate, • PGE EV Charge Rebate & Rate Discounts • MCE Charger Rebate • Property Assessed Clean Energy (PACE) Financing
Commercial/ Business	• Local Jurisdictions • Utility Providers • Air Districts • CCA's	• BAAQMD Charge! Rebate, • PGE EV Charge Rebate • MCE Charger Rebate • CalCAP Financing • Property Assessed Clean Energy (PACE) Financing
Public Infrastructure	• Local Jurisdictions • Air Districts • CMAs • CCAs • Utility Providers	• TAM Public Charger Rebate • PGE EV Charge Rebate • MCE Charger Rebate • BAAQMD Charge! Rebate • CARB VW Settlement Program

Equity of EVs

Approximately one-fifth of the Bay Area's total population live in areas with large numbers of low-income and minority populations. Promoting access to transportation for these residents helps advance equity in the region. The definition of "communities of concern" is intended to represent a diverse cross-section of populations and communities that could be considered disadvantaged or vulnerable in terms of both current conditions and potential impacts of future growth. MTC, the regional transportation planning agency, defines communities of concern as census tracts that have a concentration of BOTH minority AND low-income households. In Marin County, these areas include the Canal Neighborhood of San Rafael and Marin City in Southern Marin.

Additionally, while overall air pollution continues to decrease in the Bay Area, some communities still experience higher pollution levels than others. These communities are generally near pollution sources (such as freeways, busy distribution centers, and large industrial facilities) and negative impacts on public health in these areas are greater. BAAQMD's Community Air Risk Evaluation (CARE) Program identifies where air pollution contributes most to health impacts and where populations are most vulnerable to air pollution. CARE locations in Marin County, include the area around downtown and East San Rafael, encompassing the "Community of Concern" area of the Canal neighborhood.

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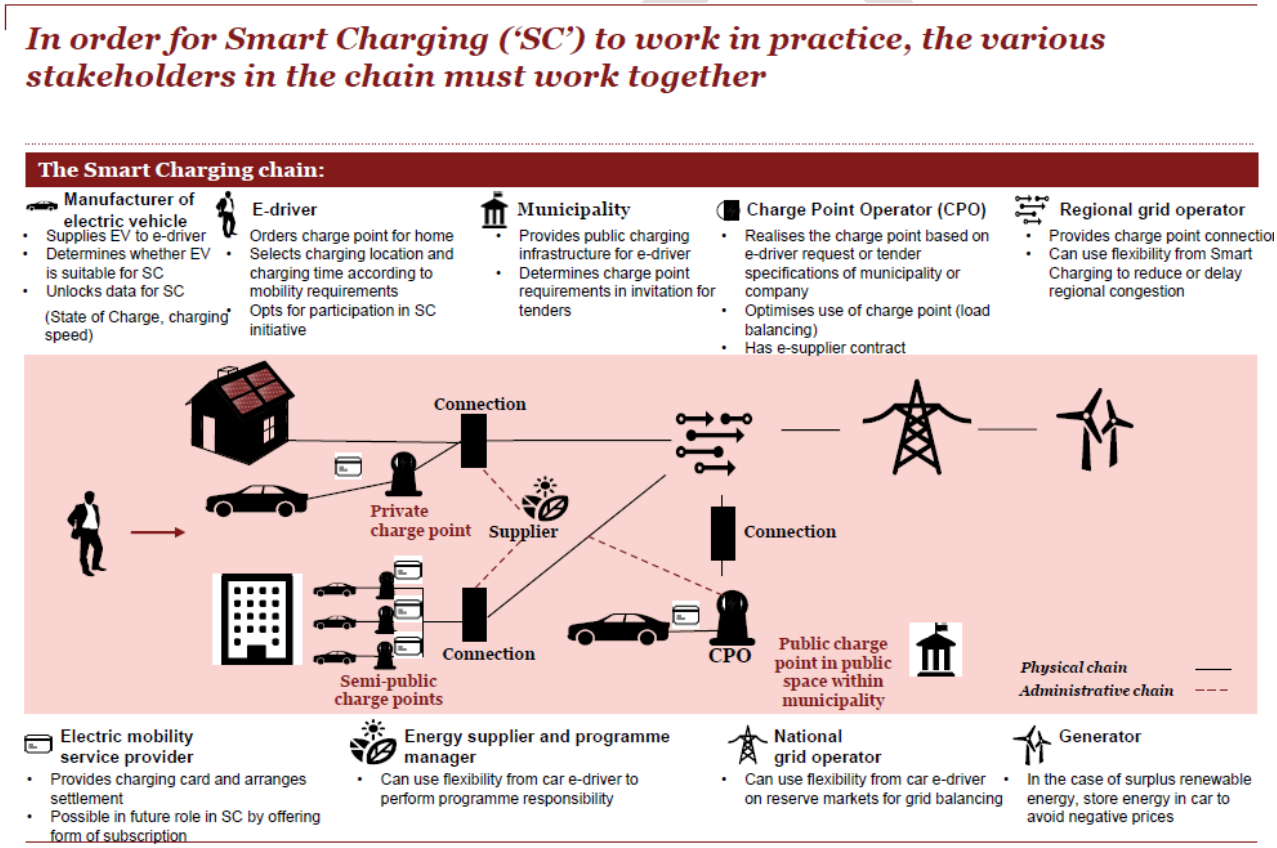
Grid Considerations

Growing EV adoption will result in changes to demand loads on the electric utility grid, with the potential for higher demand at peak hours. MCE and PGE offer incentive process structures or demand management programs known as time of use rates to encourage charging when generation is high and overall usage is low. Additionally, car charging times can be set in vehicle to offset these hours. Furthering this concept with smart chargers that can monitor grid demands in real time and adjust charging rates accordingly.[15]

Additionally, Marin County's options for renewable energy and GHG-free sources can increase the GHG reduction potential of EV vehicles. PG&E estimates that 80% of its energy is GHG free, and both PG&E[16] and MCE[17] offer 100% renewable energy options for consumers.



EV Grid Integration Chain[18]

[15] https://www.fleetcarma.com/impact-growing-electric-vehicle-adoption-electric-utility-grids/

[16] https://www.pge.com/en_US/residential/rate-plans/rate-plan-options/solar-and-renewable-energy-plans/solar-and-renewable-energy-plans.page

[17] https://www.mcecleanenergy.org/100-renewable/

[18] SMART Charing of electric Vehicles, PWC, October 2017

V. Existing EV Charging in Marin

Since the development of the 2011 EV Siting Plan, Marin County has developed a network of charging stations for EVs. As this plan looks to develop future locations of charging stations an assessment of the location and patterns of existing charging stations supports thoughtful and strategic locating of future chargers.

As of September 2018, there are 58 charging locations in Marin County available to the public and shown on online resources, namely plugshare.com. In addition to these public locations are private charging locations at residences and work locations that are not available for public use and not included in this analysis. These 58 charging locations provide a total of 201 charging ports, or approximately 1 public charging head for every 1,000 residents in Marin.

Included as part of the 201 charging locations are 10 level 3 DC fast charger, and 154 level 2 charger heads. The remaining charging locations are primarily pedestal wall outlets available to the public (referred to as level 1 chargers.)

Level 1 Charger Heads	37
Level 2 Charger Heads	154
Level 3 or DCFC Charger Heads	10
Total Charging Heads in Marin County	**201**

Existing Charging Locations in Marin

Based on data gathered from plugshare.com and TAM funding programs, TAM staff conducted an existing conditions analysis of chargers in Marin County to determine trends associated with existing charger locations.

Public charging is available in off-street lots, parking structures, and on-street parking facilities and represents the largest amount of public charging available in Marin County. Commercial and retail locations represent the next largest land use followed by business parks in Marin County.

Public Property	78
Commercial and Retail	72
Schools (Private and Public)	8
Business Parks	21
Automotive Dealers	11
Medical Facilities	11
Total Charging Heads in Marin County	**201**

The top 3 largest locations of charging heads are in San Rafael and are as follows:

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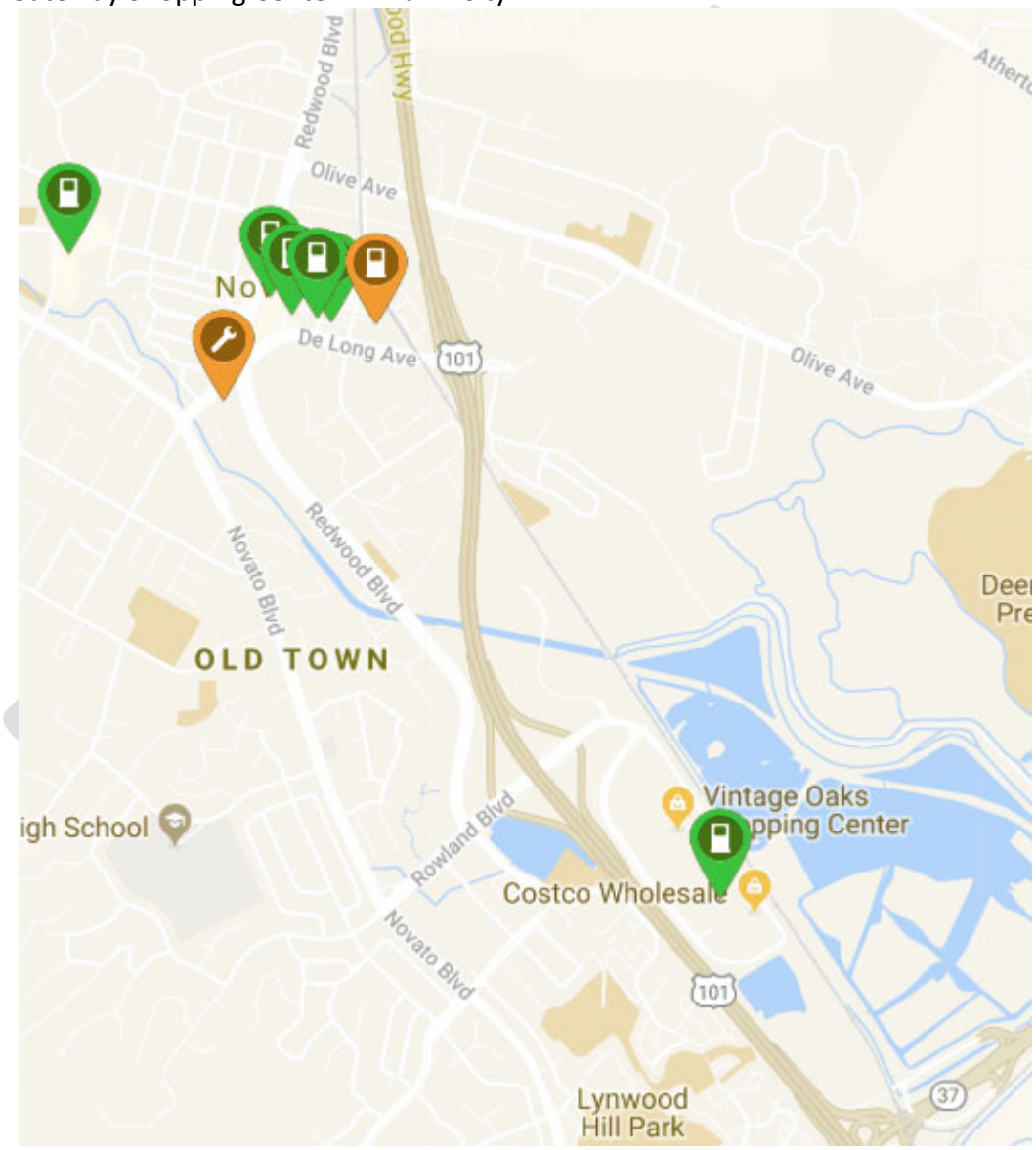
Location	Jurisdiction	Charging Heads
Target	San Rafael	20
Kaiser Permanente	San Rafael	11
Autodesk	San Rafael	8

Charging in Marin is often provided in large shopping centers, located along the Highway 101 corridor. These shopping centers provide access for commuters and attracts shoppers to locations like vintage oaks in Novato, Northgate Mall in Terra Linda, the Village in Corte Madera and the Gateway Shopping Center in Marin City.



Charging Locations along US 101 in Novato

Of public property, public parking lots and garages provide approximately 28 charging stations in Marin county, with 78 level 2 charging heads. There are no level 3 chargers located within the public right of way in Marin County. When free parking is provided, charging at these sites usually

requires a fee. Regardless of the location, restrictions on time and length of use are often implemented to ensure turnover, prevent abuse of the system and enforce facility operating hours. Public charging facilities can be utilized by neighborhood residents who lack access to charging in their buildings.

Workplace Public Charging Station at MarinCommons

Charging equipment at transit facilities are limited in Marin County. With Highway 101 providing north-south connectivity for transit services within the county, there are currently no EV charging locations within Caltrans park and ride facilities in the county. The Bettini Transit Center in Downtown San Rafael has no dedicated parking, and thus no ability to provide EV charging directly. Where ROW does exist close to transit services, such as the Larkspur Ferry Terminal, there is limited charging equipment available and these spots are often filled. The Tiburon and Sausalito ferries do not have EV charging equipment located in nearby lots adjacent to these facilities. TAM has funded make ready charging infrastructure at SMART stations, however chargers have not been installed yet.

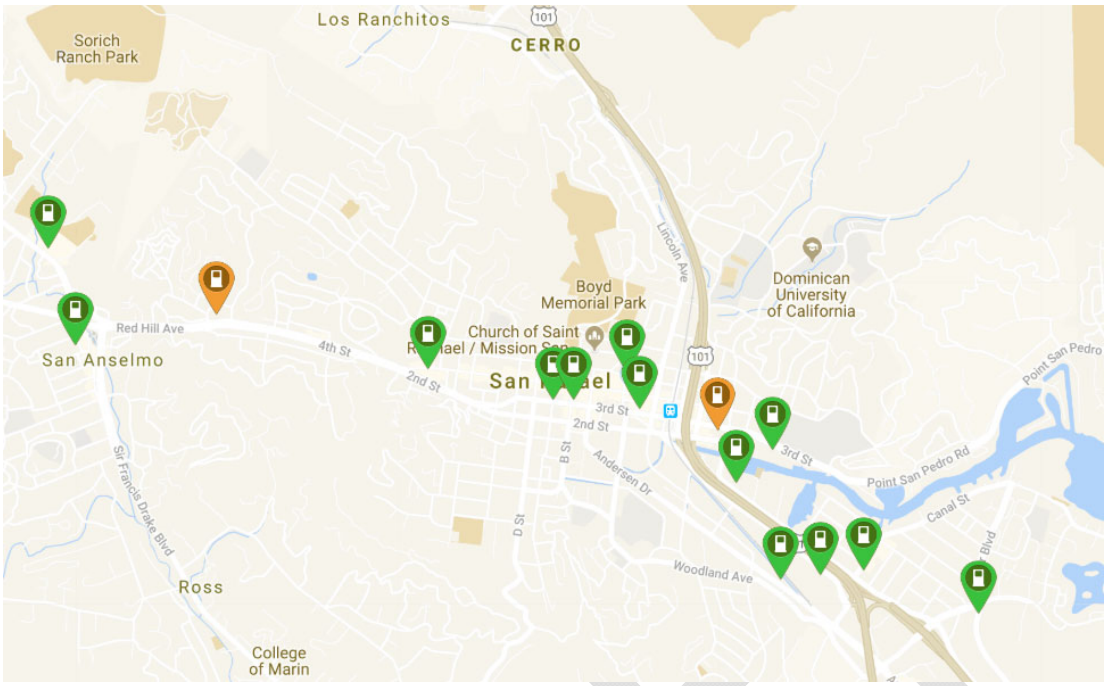
Outdated Equipment and Limited Availability of Public Charging at the Larkspur Terminal[19]

Redwood High is the only public school with charging equipment in Marin County, and Dominican University and Mark Day private schools provide public charging equipment.

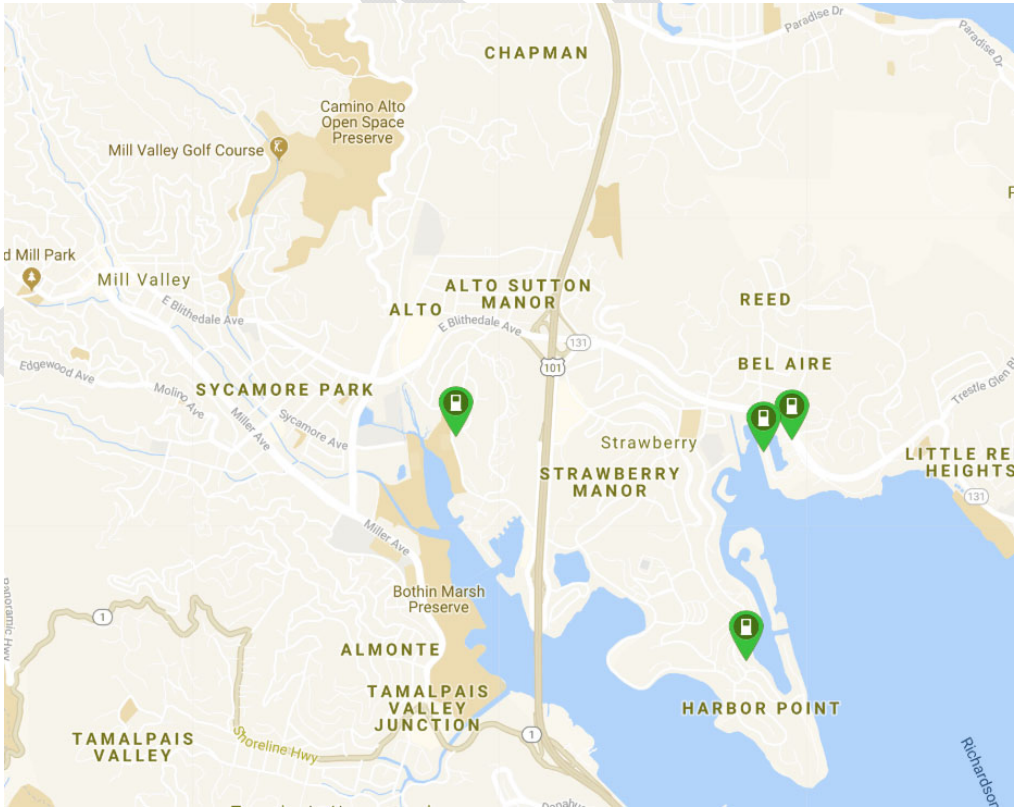
The city of San Rafael currently has the most charging locations with 21 charging locations providing 76 level 2 charging ports and 90 charging ports overall. There are 5 DCFC level 3 fast chargers in the city, however one is located at an automotive dealer potentially limiting the public use of the charger.

Southern Marin has a limited number of publicly available charging locations with gaps in coverage near the Strawberry and Mill Valley areas. West Marin along with Muir Woods and the Golden Gate National Recreation area has chargers available for trips to Marin County recreation areas, including Point Cavallo.

[19] Photo Courtesy Plugshare.com,. accessed September 2018



Charging Locations in Downtown San Rafael



Limited Charging Locations between Corte Madera and Marin City in Southern Marin

TAM Funding in Use

Since 2011, TAM has funded 60 charging locations primarily within the public right of way with one location on public property for agency use only. Marin County has installed the most chargers of any jurisdiction, while Sausalito, Corte Madera and special districts have not applied for any TAM grants to date. Some of these chargers are no longer in use due to age and maintenance issues.

Agency	# Charging Spots and replacements Funded by TAM
Belvedere	4
Mill Valley	3
Fairfax	4
Larkspur	6
Novato	8
San Anselmo	4
San Rafael	8
Marin County	16
Kentfield School District	2
Tiburon	2
Pt. Reyes Nat'l Seashore - Bear Valley lot	3
Total	**60**

The exact locations of these chargers are below.

Company/Station Name	Location of charging stations	# of Ports
City of Belvedere - 1	450 San Rafael Ave. Belvedere	2
City of Belvedere - 2	450 San Rafael Ave. Belvedere	2
Marin Health & Wellness Campus	3240 Kerner Blvd, San Rafael	2
Civic Center	3501 Civic Center Drive, San Rafael	2
Marin Center	10 Avenue of the Flags, San Rafael	2
Piper Park - 1	250 Doherty Drive, Larkspur	2
Piper Park - 2	250 Doherty Drive, Larkspur	2
Central Marin Police Authority	250 Doherty Drive, Larkspur	2
City Council Chambers	901 Sherman Avenue, Novato	2
Gymnastic Teen Center	950 7th Street, Novato	2
Hamilton Community Center	503 S. Palm Drive, Novato	2
Zenk Parking Lot - 1	913 Reichert Ave, Novato	2
Zenk Parking Lot - 2	913 Reichert Ave, Novato	2

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Company/Station Name	Location of charging stations	# of Ports
Zenk Parking Lot - 3	913 Reichert Ave, Novato	2
City Hall Parking Lot	142 Bolinas Road, Fairfax	2
Parkade Parking Lot-1	9 Broadway Ave, Fairfax	2
Parkade Parking Lot-3	9 Broadway Ave, Fairfax	2
Magnolia Lot - 1	San Anselmo Ave	2
Magnolia Lot - 2	San Anselmo Ave	2
Magnolia Lot - 3	San Anselmo Ave	2
Magnolia Lot - 4	San Anselmo Ave	2
Public Safety Building	1 Hamilton Drive, Mill Valley	2

Electrify America / VW Settlement

In June 2016, California and the federal government reached a settlement with Volkswagen stemming from Volkswagen's violations of emission control requirements. To mitigate in part for the environmental harms from the violations, Volkswagen agreed to invest $800 million in California in zero-emission infrastructure and access over a ten-year period. Eligible investments include fueling infrastructure, public education and marketing programs, efforts to increase access among consumers to ZEVs and creation of "Green City Programs." Investments must be brand neutral. Under the settlement, Volkswagen will submit ZEV investment plans every 30 months; the California Air Resources Board will provide comments and approve each plan after those comments are addressed.

Called Electrify America, the first phase — installing over 2,000 chargers at 484 stations — will be completed by 2027 nationwide. Installations are being planned at apartment complexes, workplaces, shopping malls and hotel parking lots, plus existing fuel stations and on the street side in some areas. This program is teaming with retail property owners like Walmart and Target aiming for a "retail, convenience and refueling strategy" for EV drivers.[20]

PGEs EV Charge Network

In January 2018, PG&E launched its EV charge Network pilot program to install 7,500 chargers in the PG&E service area over northern and Central California. With a budget of approximately $130 Million, PGEs investment in EV charging covers all of the cost of the infrastructure (excluding the charging equipment) and will own and maintain the infrastructure (unless the site host purchases the chargers). The program is limiting to multi-unit dwellings and workplaces with a minimum of 10 charging heads per location.[21]

MCE Charging Station Program

[20] https://www.engadget.com/2018/04/23/target-and-electrify-america-ev-charger-expansion/

[21] https://www.pge.com/en_US/business/solar-and-vehicles/your-options/clean-vehicles/charging-stations/program-participants/about-the-program.page

To maximize the benefit from PGE's EV charge Network, MCE has developed a pilot program to provide additional incentives for EV charging infrastructure in its service area. Offering rebates of up to $2,500 per charging head, the pilot program is designed for workplaces and multifamily properties in its service area. the project size can range from 2 to 20 charging ports and was launched in August 2018.[22]

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[22] https://www.mcecleanenergy.org/wp-content/uploads/2018/08/EVSE-overview-flyer_FINAL.pdf

VI. Siting and Placement Principles

Prior to determining specific locations for the siting and placement of EV chargers, it is essential to identify key principles or considerations that impact the success of an EV charging unit. Through the development of TAMs Electric Vehicle Supply Equipment (EVSE) program and local jurisdictions installations the following EV infrastructure design principles and priorities are presented.

As the industry standard, this section is geared towards level 2 chargers, except when noted. Level 2 chargers require 240 volt installation, which is wired to most buildings in Marin County. All electric cars on the road today can accept level 2 charging. In some cases, Level 1 charging may be appropriate and encouraged to provide additional charging ports at low costs. Level 1 charging or wall outlets, use standard 120v wiring and can provide charging at lower rates, appropriate for longer duration charging locations.

In other cases, level 3 or DC fast charging may also be appropriate. As a quick charge, these chargers can provide 80% of a full charge in 30 minutes. Appropriate siting locations including along major roadway corridors where convenient refueling is required, similar to gasoline refueling. However this equipment can be expensive to install and may not be necessary where EV drivers will spend a significant amount of time, and thus a level 2 would be appropriate.

Considerations relating to cost, safety, and other issues have been well-researched in various reports. Based on this research and feedback from Marin local government staff, TAM identified the following principles to guide EV charger installation in Marin:

(1) Primary Global Principles – Those factors that are of highest importance when deciding on overall sites to locate EV charging stations.

(2) Secondary Global Principles – Additional factors of secondary importance to consider when selecting overall locations for EV charging stations.

(3) Site Specific Principles – Priority factors to consider when determining the specific location within a general site where the EV charging station(s) will be installed.

Please note that some criteria are listed both under global principles and under site specific principles. In the case of global principles, it is a question of whether the overall location meets the principle. In the case of site specific principles, it is a question of which particular spot at that overall location will best meet the principle.

Primary Global Principles

1. **Location:** Select a high-impact, visible location (especially for the first few chargers)
2. **Electricity:** Select a location where Level 2 (240V/40A) electrical supply is or can be made available with relative ease and minimal cost. (See Appendix C for descriptions of EV charger levels.)
3. **Access:** Consider and comply with ADA guidelines for disabled access, and take precautions

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to ensure that chargers are placed with the user's convenience in mind (avoiding injury from tripping on cords and cables, etc.)

4. **Security:** Select a secure location with adequate lighting to enhance security and provide the customer with a good charging experience.
5. **Signage:** Provide enforcement and other signs that comply with the Manual on Uniform Traffic Control Devices **(**MUTCD) and California Vehicle Codes (CVC), ensuring that signs are high enough, easily visible, and provide clear and accurate information.
6. **Equipment Protection:** EV chargers should be placed where they can be best protected from physical damage by such measures as curbs, wheel stops, setbacks, bumper guards, and concrete-filled steel bollards, while simultaneously taking into consideration ease of access to the charger, mobility of users, and foot traffic in the area.
7. **Fleet Use:** Consider "dual purpose" sites that could also benefit the jurisdiction's fleet vehicles, as well as the general public, where feasible and appropriate.

Secondary Global Principles

While the principles above received the highest priority ratings from Marin jurisdictions, many other criteria are also to be considered in the siting of EV chargers:

- **Diversity of Intended Users:** EV chargers should (progressively) be located in sites that will appeal to the diversity of users (e.g., local residents, visitors and tourists, and fleet drivers)
- **Public Safety:** Chargers should be located in areas with proper ventilation and away from potential hazards including traffic, explosive materials, flammable vapors, liquids and gases, combustible dust or fibers, materials that ignite spontaneously on contact with air, flood- prone areas, and away from areas that might be prone to vandalism.
- **Duration of Use:** Level 2 Charger sites should focus on locations where EV owners will be parked for a significant period of time (e.g., one to three hours). DC Fast Chargers sites should focus on locations where the EV owner will be parked for a relatively short period of time (e.g., 15 minutes).
- **Economics:** The costs of charger installation and potential loss of parking space revenue should be weighed against the benefits of projected revenues, positive publicity, and increased visitor spending in the jurisdiction, as well as the broader societal benefits of spurring the transition to clean, low-carbon transportation.
- **Location Markings:** Indication of parking spaces, striping, driveways, and walkways.
- **Cord Management:** To avoid injury from tripping, cords should not cross sidewalks or pedestrian traffic patterns.
- **Shelter:** When possible, shelter is desirable to protect users from weather when connecting their vehicle to the charger. (However, chargers are designed to be safely operated in exposed locations in the rain, with no danger of electrical shock.)
- **Aesthetics:** Some areas benefit from the installation of landscaping or screening walls to shield the electrical transformer, panel, or other equipment from the public eye.
- **Solar Power:** Some jurisdictions may choose sites where solar panels can provide energy

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to power the charging unit.

- **Other EVs:** Locations may be chosen to cater not only to freeway-capable battery-powered
- **EVs (BEVs) and plug-in hybrid EVs (PHEVs)** – which typically utilize the 240 volt "Level 2" connections for faster charging – but also to Neighborhood EVs (NEVs), electric bicycles, electric scooters, and electric motorcycles – which typically utilize a 110 volt electrical connection.

Site Specific Principles

Furthermore, when developing Site plans, the following site-specific principles should be considered:

- **Accessibility:** EV charger location within a site should comply with ADA access requirements. Specifically, the first two EV chargers installed in any one location should take into consideration requirements in California Building Code Chapter 11C and DSA 97-03.
- **Electrical Supply:** Select a location where it is as inexpensive as possible to provide Level 2 (240V/40A) electrical supply.
- **Benefits vs. Loss of Revenue:** When selecting the specific location of an EV charger at a particular site, a jurisdiction should consider the balance of anticipated benefits (including "EV readiness," revenue potential, and increased patronage of nearby business) versus potentially negative aspects of taking an available parking space (including negative impact on conventional vehicle drivers and lost revenue).
- **Cord Management:** When determining where to install an EV charger, a location should be selected where cords will not interfere with the path of travel of the user or other pedestrians in the vicinity.
- **Security:** A location should be selected that is secure for users at all times of day and night and relatively secure from vandalism (e.g., in well-lighted areas and in well-travelled areas).

Networked Versus Non-Networked EVSEs

Networked or "Smart" charging technology provides the ability to connect EV charging stations to a network, allowing remote monitoring of stations, setting charging costs, providing payment collection, maintenance alerts, and provide data to respond to demand management, enforcement, operations, utilization and grid management data. However, in some locations, network access can increase installation costs and non-networked charging equipment may be preferred. These include private or controlled access lots, or remote locations where extensive costs may be incurred to connect to the grid.

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Networked chargers provide a mechanism for cost recovery, providing a means of ensuring turnover so that there can be adequate charging access for all drivers. Charging a nominal fee for electricity, time or some combination thereof, disincentivizes “accessory charging”, or charging vehicles simply because the service is available, rather than a necessity.

Tracking energy usage is also necessary to analyze electricity usage and costs, observe charging behavior, and collect payment. Monitoring capabilities allow station managers to quickly identify operations and maintenance requirements and monetize the emissions-reduction benefit through the State’s Low Carbon Fuel Standard program, which can reduce costs. Non-networked (“dumb”) charging stations cannot earn revenue because they cannot track energy usage required for reporting.

Smart charging stations are also capable of managing electrical loads to prevent strain on the grid and mitigate peak demand charges. Some smart charging technologies can determine when stations are not in use and divert the power to occupied stations, rather than blocking the amperage when not in use. Additionally, charging rates decrease when multiple vehicles are plugged in at the same time, however smart systems can detect when a battery is fully charged and will begin delivering full power to another vehicle.

ADA Requirements and Standard Site Plans

Physical accessibility standards for EVSEs play a large role in the siting of EV charging stations. The Americans with Disabilities Act (ADA) requires that EVSEs must be accessible to and useable by individuals with disabilities. In practice, these requirements influence site design in public parking lots and on street parking and introduce risk and liability concerns on public agency partners. Planning for accessible design is an important element of EVSE infrastructure development, and sample layouts are provided by the California Department of General Services Below.

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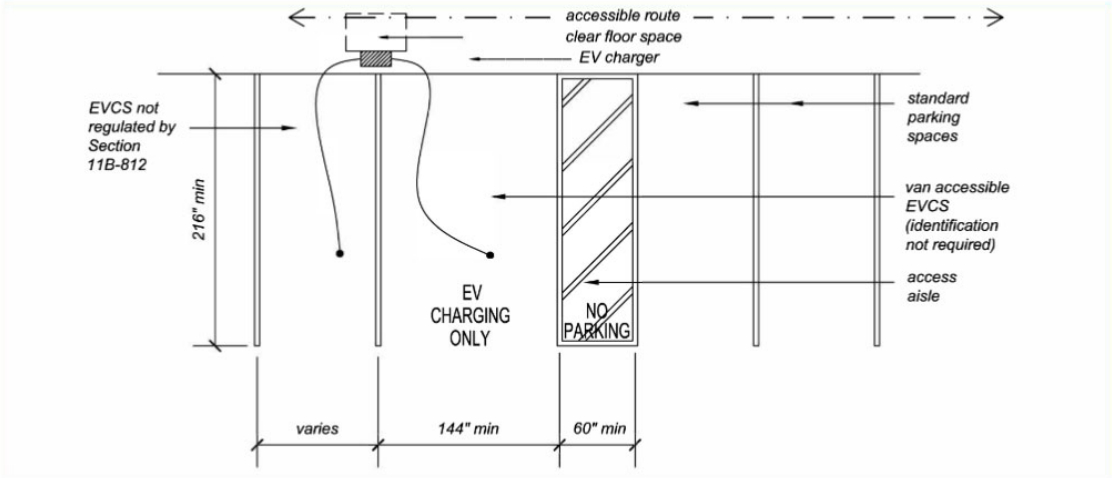
EV Charging Stations

Sample Layout (1 of 3)

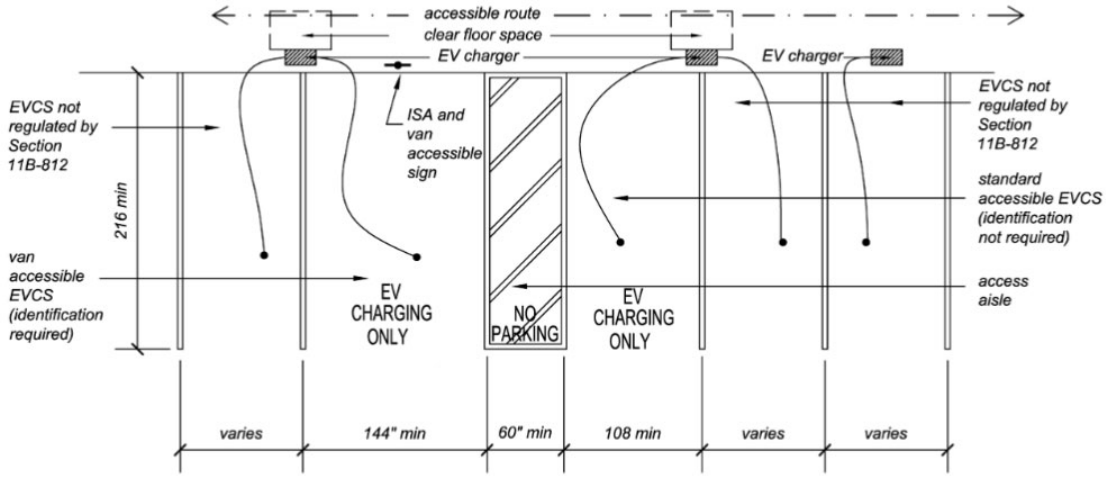


Two EVCS: one van accessible EV spaces required

DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

EV Charging Stations

Sample Layout (2 of 3)



Five EVCS: two accessible EV spaces required

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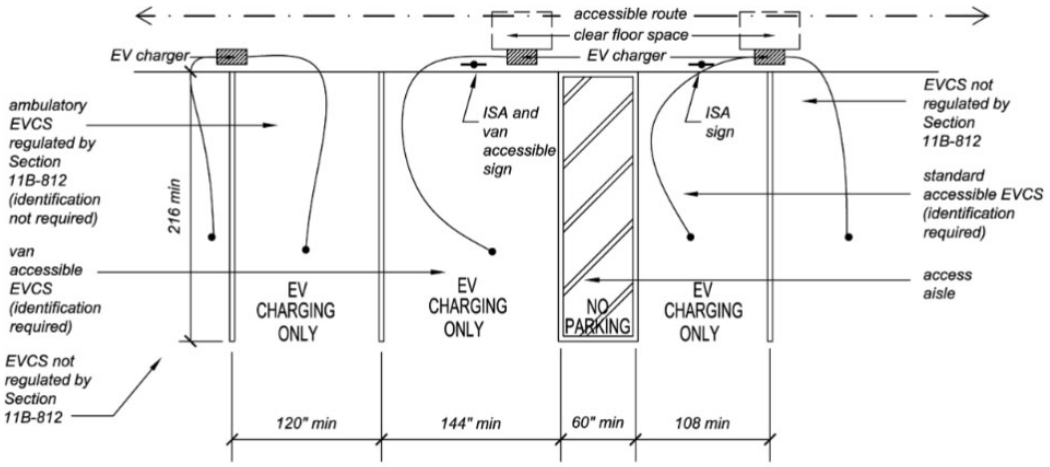
EV Charging Stations

Sample Layout (3 of 3)



26 EVCS: three accessible EV spaces required

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Maintenance/Replacement of Existing Chargers

Since the development of the 2011 site plan, various brands and models of chargers have been provided in Marin County. Property hosts determine the charging equipment to install and are responsible for coordinating the maintenance of this equipment. As technology has advanced the need for maintenance and replacement of existing chargers has also grown. In most cases, the installation costs to replace existing stations will be significantly lower than at new sites without the electrical wiring and conduit already in place. However, the costs to replace the existing EVSE and add new stations are largely dependent on the extent of electrical services needed. Dual-port charging units are preferred to single-port units due to lower installation and maintenance costs and smaller space requirements.

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VII. LOCATIONS FOR EV CHARGING INFRASTRUCTURE

Since the development of the 2011 EVSE Siting Plan, Marin County has advanced its EVSE public infrastructure through a robust program designed to accelerate publicly accessible EVSEs in publicly owned right of way and parking lots. By working closely with local agencies, TAM has helped accelerate EVSE installations in the county. These section describes initial sites identified through TAM-sponsored education and outreach. In this effort, a few key factors merit highlighting.

Preliminary Plan

The identification of these sites constitutes a preliminary list and starting point for planning efforts. It is anticipated that the list will be further refined as jurisdictions review current sites and gain experience in delivering sites, and as program eligibility rules and requirements change. It is important to also note that this list of sites are dependent on demand, which changes based on vehicle availability, public mandates, and funding eligibility and availability. TAM is a single entity but not the sole agency supporting EVSE installation, and partners with a wide range of local agencies, including local jurisdictions, air districts, public utilities and Community Choice aggregates, and other transportation agencies.

Municipal Versus Private

The primary focus of TAM has been identification of "publicly-accessible charging stations" planned for installation by municipalities and public agencies in the county. Charging stations accessible to the public may be installed on either public property or private property generally accessible to the public (e.g., in mall parking lots and major office complexes). With growing public utility and other agencies' EVSE programs focusing on private property, this section addresses areas of needs that may require private property site hosts.

Additionally, since 2011 private enterprises have matured and networks such as Chargepoint, blink and Tesla have developed siting plans specific to their business needs. Determining these exact locations is not possible at this time, nor required for this analysis.

Level 2 Charging Locations – In Progress

The following locations for Level 2 EV chargers in Marin County have been developed based on discussions with member agencies and public entities in Marin County. As an initial list, this section reflects desired charging equipment and will be subject to changes as needed through the site planning and development process and may be updated as needed based on new information and locations. It is important to distinguish between the number of "chargers" and the number of "charge points" for this effort:

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Location	Sponsor	Number of Charging Heads
Marin County Civic Center	Marin County	41
San Rafael Schools (multiple locations)	San Rafael School District	32
Magnolia Parking Lot, 8-20 Magnolia Ave, San Rafael, CA 94901	Town of San Anselmo	8
Various Locations in Novato	City of Novato	14
College of Marin, 835 College Avenue, Kentfield CA, 94904	College of Marin	36
1125 Tamalpais Ave, San Rafael, CA 94901	MCE	5
In Progress Level 2 Charging Heads		*136*
Existing Level 2 Charging Heads		*154*
Total Level 2 Charging Heads (In Progress + Existing)		**298**

As noted in Section 4, there are 154 existing level 2 chargers in Marin County. The In Progress list would add 136 level 2 chargers, providing an increase of approximately 88% of the level 2 charge points in Marin County. At the time of this report, TAM is also considering changes to the eligibility requirements of its EVSE charge program, to encourage the growth of EVSE equipment in Marin county and improve the project delivery process for implementing agencies. These changes to streamline eligibility are likely to grow the pool of potential chargers in Marin County even further then in progress sites identified above.

Level 2 Charging Locations – Opportunity Sites

With recent PG&E, MCE, Air District and Electrify America Program developments, there are multiple locations that are offer an opportunity to increase the EV charging supply over the next couple of years. These locations are identified below. In order to advance these locations, site plans will need to be developed and site hosts must be identified to facilitate the project development, operations and maintenance of these sites. These sites are expected to qualify for a range of public grants, including from BAAQMD, MCE, PG&E and TAM, as well as private investment or as part of a development agreement. Facilitating the development of these sites will require cooperation and funding from a range of agencies based on program eligibility requirements and available resources.

Based on the existing conditions analysis in section 4, opportunity areas for charger installations exist throughout Marin County. These locations include:

- **Southern Marin** – Based on a review of the existing charging locations in Marin County, there is a limited supply of publicly available EV charging stations in Southern Marin

County, namely around the TAM junction, Mill Valley and Strawberry communities. Recent tenant changes at the Marin Gateway shopping Center have increased the supply of EVSE equipment in Marin City for residents and commuters on Highway 101, however focus should be provided on expansion of EV charging locations in Southern Marin to support residents, commuters, recreational visitors, the business community and transportation hubs. Public Facilities in these areas, including school parking lots, community centers and on-street locations should be considered for EV charging installations. Opportunities along frontage roads next to Highway 101, Miller Avenue, Blithedale Ave, Highway 1, Camino Alto and other major road corridors should be considered for charging locations.

- **Shopping Centers** – Electrify America is currently building out its EV charging infrastructure network focusing on large retail property owners like Target and Walmart and these efforts should be supported for large scale deployments of EV charging stations. A similar approach is being undertaken by Tesla, that would allow piggyback opportunities at these sites for additional EV charging equipment for non-tesla EVs. With PGE and MCE grants available, private shopping center locations in Marin County that may be low cost and installation of EV chargers, including strawberry shopping center, the town center in Corte Madera, Bon Aire shopping center and an expansion of EV charging at Northgate Mall in Terra Linda.
- **School Locations** – School parking lots provide an opportunity for EV charging station expansion to support teachers and school officials but can also serve to support evening and nighttime charging for local residents. Parking at school locations throughout Marin is often impacted, however where space is available EV chargers can provide employees encouragement to switch from gas powered vehicles to EVs.
- **SMART Stations** – With the Launch of SMART service in 2017, TAM has provided funding for “make ready” EV infrastructure at the San Marin and Hamilton SMART parking lots in Novato. Providing EV chargers at these locations may be a cost-effective opportunity to support commuters and increase EV charging supply. Providing EV infrastructure at other Marin SMART stations poises more challenges with determining site locations, however nearby parking lots either private or public should be considered for expansion of EV charging supply.
- **Ferry Terminals** – Larkspur Ferry terminal currently provides 2 EV charging spaces to support commuters into San Francisco. As one of the most heavily impacted parking locations in Marin County, parking management is a challenge at this site, however expansion of EVSE equipment would demonstrate Golden Gate Ferry’s commitment to GHG reduction and support clean transportation to this site. Other ferry locations in Marin County including Sausalito and Tiburon, parking lots are provided by the local jurisdiction and these lots should be considered to support commuters along with private

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parking locations in the immediate location.

- **Park and Rides / Caltrans facilities** - Park and Ride locations owned by Caltrans are important mobility hubs for Marin County and can serve to demonstrate Caltrans commitment to supporting ZEV goals set by the state. These locations are often parking impacted, especially in southern Marin, and Caltrans policies regarding right of way and operations and maintenance often limiting practical locations of EVSE in Caltrans ROW. However, the opportunity to support Caltrans in this effort may be supported by TAM funding of public agency chargers.
- **Marin General Hospital** – the renovation of the Marin General Hospital currently underway includes installations of EVSE equipment within the parking structure. As construction proceeds, these publicly available EVSE sites are expected to serve employees and hospital visitors.
- **Disadvantaged Communities** - Marin's two designated communities of concern include Marin City in Southern Marin and the Canal Neighborhood of San Rafael. Increasing EV infrastructure in these communities supports access and EV adoption for all residents in Marin. With 5 existing chargers in Marin City, increasing the number of these chargers, or identifying another potential location in Marin City, perhaps as part of redevelopment efforts could promote EV adoption in Marin City. The Canal Neighborhood currently has access to a charge port at the Marin County Health and Human Services building on Kerner, and limited access to chargers located as part of automotive dealers in the area. Providing additional charging infrastructure directly for residents at locations like Pickleweed Park or on street would support EV users in this community.

Level 3 or DCFC Charging Locations

In order to reach the state ZEV goals and increase the range of EV's, public fast charging allows more gasoline miles to be converted to electric miles. Public DCFC is also critical to reducing range anxiety and meet consumers expectations and preference for faster public charging. Recognizing these needs, PGE has developed a mapping tool under the Electric Program Investment Charge (EPIC) program to identify locations where DCFC siting best promote EV adoption[23].

The EPIC DCFC mapping tool using forecasts of EV adoption, locations of existing DCFCs, locations with available distribution capacity and siting factors to map out 300 general locations for DCFCs in PGEs service area and 14,616 potential individual site hosts within the 300 general locations.[24] Of the 300 locations in PGE's service area, the mapping tool ranks locations based on unmet

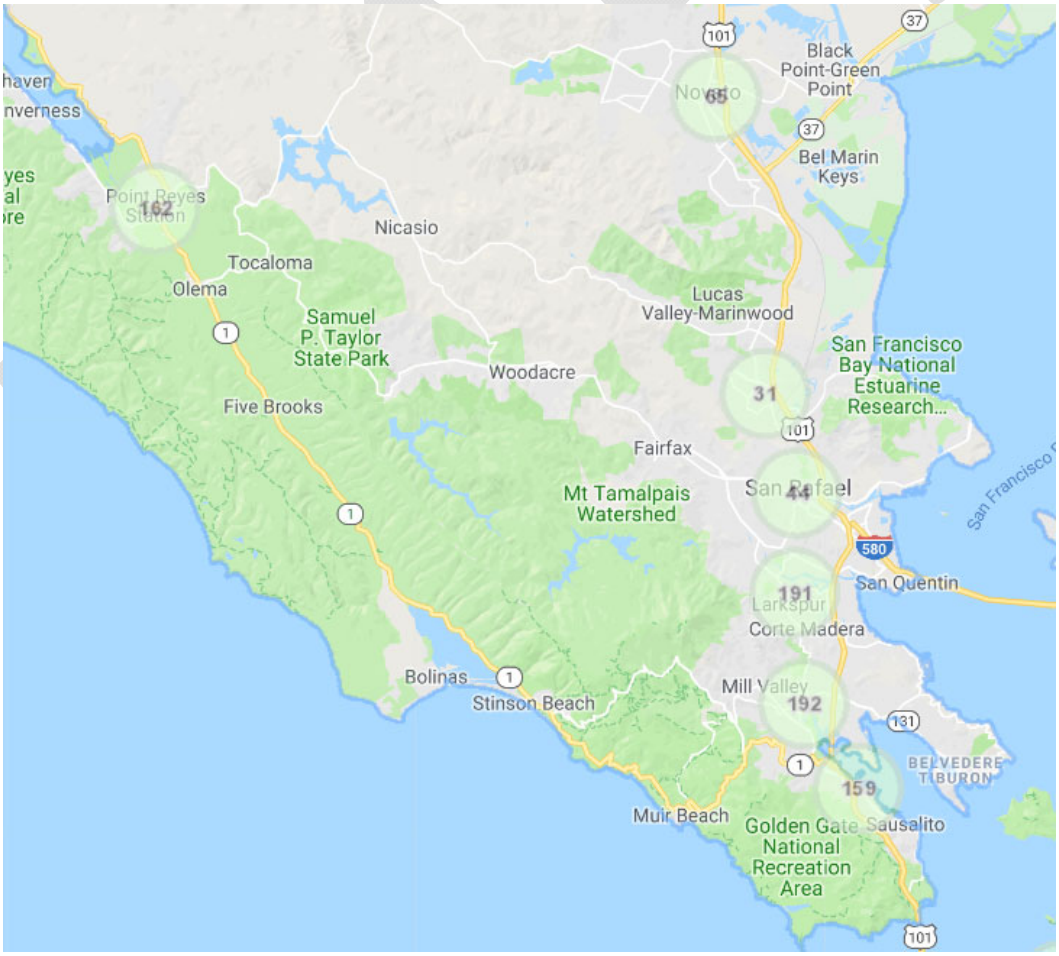
[23] https://www.pge.com/pge_global/common/pdfs/about-pge/environment/what-we-are-doing/electric-program-investment-charge/EPIC-1.25.pdf

[24] https://www.pge.com/b2b/energysupply/wholesaleelectricsuppliersolicitation/PVRFO/ev.html

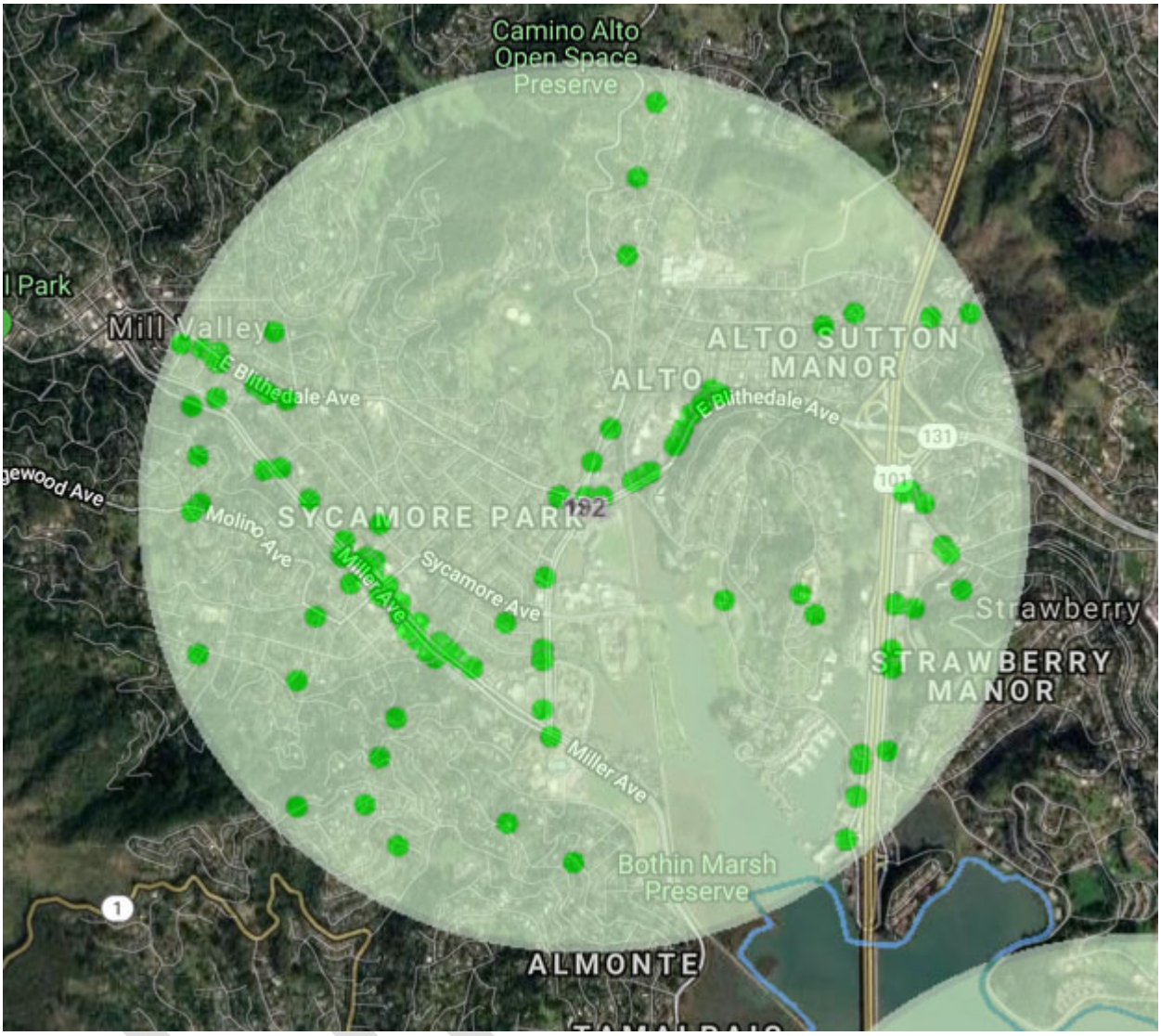
demand. This ranking excludes factors like costs, or increasing EV adoption, or supporting disadvantaged communities. Based on this ranking (1-300) the tool identified identifies 7 general locations in Marin County, and the additional new DCFCs needed by 2025 including:

Site Number	Location	New DCFCs
33	Terra Linda	3
44	Downtown San Rafael	3
65	Downtown Novato	2
159	Sausalito	1
162	Point Reyes Station	1
191	Larkspur/Corte Madera	1
192	Mill Valley	1
Total New DCFCs		*13*
Existing DCFCs		10
Potential DCFCs in Marin County		**23**

These locations are shown in the map below:



PGE EPIC Program DCFC Fast Charging locations in Marin County



PGE EPIC Program Site Specific Locations for DCFCs in Mill Valley

Innovative Charging Opportunities

Providing resources and options to support innovative charging throughout Marin county could also support the expansion of EV equipment throughout the county. Recent technological advancements to reduce costs of installations within the public right of way should be explored for potential applications by interested site hosts. Site conditions like access to power, ADA considerations and enforcement all would need to be addressed to support innovative approaches, however pilot programs could be considered to investigate feasibility.

VIII. CONCLUSIONS

Given the growth in EV infrastructure since the development of the 2011 Site Plan, this update lays forth a path for the rapid deployment of EVSE equipment in Marin County. This update also supports site hosts and jurisdictions to identify potential locations to further grow the EVSE supply in Marin County. It is reasonable to expect that these sites will grow in number with changes to funding eligibility requirements and continued support from a wide range of funding partners.

However, growing the pool of candidate locations also requires additional efforts to enable the development of these sites. These include potential modifications to incentives administered by TAM, permit streamlining for EVSE installation by local jurisdictions and project delivery assistance to streamline site planning and installation. TAM and local agencies will continue to partner to implement this site plan and will provide regular updates to this plan as appropriate.

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Appendix A: TAM EV Charging Inventory

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